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President and
General Manager,
CH2M HILL Hanford Group
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Tank farm workers achieve major cleanup goal



Jim Bateman,
president of the
Hanford Atomic
Metals Trades
Council, was one of
the speakers.



In the top photo, Washington Attorney General Christine Gregoire, Congressman Doc Hastings and Department of Energy Office of River Protection Manager Roy Schepens join CH2M HILL employees in listening to speakers at the Interim Stabilization celebration on Aug. 23 on the Hanford Site. Workers and guests (bottom photo), sign a large poster commemorating the Interim Stabilization celebration.

In ceremonies on Aug. 23 on the Hanford Site, employees of CH2M HILL, the Office of River Protection and guests celebrated the completion of a major Hanford cleanup accomplishment—the removal of all pumpable liquids from Hanford's single-shell underground radioactive waste storage tanks.

Roy Schepens, manager of ORP congratulated the assembled workers and guests, "I knew this day would come and we would celebrate this accomplishment together, because I witnessed the enthusiasm and tenacity of the Hanford workforce. You have done a wonderful job."

"While this is just one step on the path to completing Hanford tank cleanup, it has great significance for the people of the region and the environment," said Ed Aromi, president and general manager of CH2M HILL Hanford Group. "It means these aging tanks, some of which date back to the beginning of the Manhattan Project, will never again be able to leak their contents into the surrounding soil. I am extremely proud of our dedicated workforce who worked so hard to reach this milestone."

The transfer of the liquids from the older single-shell tanks to safer, double-shell tank storage, a project known as interim stabilization, began in the early stages of Hanford cleanup. However, in 1999 the Department of Energy and the state of Washington agreed to a more aggressive schedule to pump liquids from the remaining 29 tanks in a legally enforceable agreement called a "consent decree."

With the removal of the pumpable liquids, the stage is now set for the next phase of tank waste cleanup — the retrieval of the sludges and solids that still remain in the tanks. That material, too, will be transferred to safer double-shell storage. Interim stabilization is discussed further on page 7 in the article, "Department of Energy reduces risk to groundwater and Columbia River."

Tank farms move into the future with wireless technology

A "canopy" of wireless capability that will be in place by the end of summer will support the use of remote cameras to reduce personnel entries into the tank farms and the use of Tablet PCs to improve accuracy and efficiency of work in the tank farms. CH2M HILL Hanford Group is teaming with Lockheed Martin Information Technology to expand the infrastructure that will enable workers in the 200 Areas, the location of the underground waste storage tank "farms," to access the Hanford Local Area Network, or HLAN, at any location.

Key to this access is the placement of two large antennas, one in 200 East and one in 200 West.

A Tablet PC is fitted with a wireless card that enables it to transmit and receive information from an access point, which is wired to a receiver/transmitter that receives and sends signals to the closest large antenna and makes the connection to the HLAN.

Michael Geffre, fieldwork supervisor for CH2M HILL Maintenance, and a staff of four instrument technicians are piloting the use of ruggedized Tablet PCs—portable personal computers the size of a clipboard—to record and access information in the course of their preventive maintenance of instruments in the field.

(Continued on page 3)



Michael Geffre (center), fieldwork supervisor for Maintenance, demonstrates one of the Tablet PCs, wireless personal computers for field use, for Office of River Protection assistant manager of the Tank Farms Project John Swailes (seated) and ORP Manager Roy Schepens.



I have the privilege of introducing this issue of the *River Sentinel*, covering the activities of the River Protection Project during the spring and summer 2004. A common thread among the articles in this issue is the people of CH2M HILL Hanford Group, Inc.; Bechtel National, Inc.; and the Office of River Protection continuously seeking and implementing new ideas to improve safety in the workplace, developing innovative and improved technologies in response to information we gain from the complex work we do every day.

One of the highlights of the summer for CH2M HILL was the achievement of a major cleanup goal. Through the dedication, innovation and hard work of all its employees, CH2M HILL completed the removal of pumpable liquids from Hanford's single-shell radioactive waste storage tanks ahead of the Sept. 30 deadline. On Aug. 23 we celebrated that accomplishment with ORP General Manager Roy Schepens, Washington Fourth District Congressman Doc Hastings, Washington Attorney General Christine Gregoire, Washington State Department of Ecology Manager of the Nuclear Waste Program Mike Wilson, Oregon Department of Energy Director Michael Graine, and our employees. This accomplishment builds a solid foundation for the next important phase of our work—the removal of the solids and sludges from those tanks.

CH2M HILL is also demonstrating bulk vitrification as a supplemental treatment for low-activity waste and we are preparing to construct a new landfill for low-level waste. In fall, wireless technology will be available throughout the tank farms. This innovation will mean that all workers in the tank farms will be able to enter, store and access the data gathered during work, and have the resources of the Internet available to them in the tank farms anywhere, anytime.

A tip of the hat goes to the good men and women of the Waste Treatment Plant Construction Project. For superior achievement in safety, performance and

support of the Bechtel corporate charter and vision, they have been recognized as the Direct Hire Construction Team of the Year, chosen from all Bechtel construction teams world-wide. Construction on the Waste Treatment Plant is progressing well, and within this issue you can read about the progress on constructing the Pretreatment Facility.

In the midst of our progress on tank waste cleanup, one thing remains the same: CH2M HILL's commitment to the safety of our workforce. Our customer, the Office of River Protection, supports this commitment to safety in the tank farm work and in the work on the Waste Treatment Plant as well. Roy Schepens and the Office of River Protection are also leading the charge to focus on compliance with the Tri-Party Agreement milestones agreed upon by the U.S. Department of Energy, the U.S. Environmental Protection Agency and the state of Washington.

CH2M HILL has bolstered its industrial hygiene program from all angles. The addition of Dr. Thomas J. Anderson as our first director of Environmental Health will help us apply the concept of ALARA (as low as reasonably achievable) to chemical vapor exposures. We have increased our personal monitoring. We have convened a Health Effects Panel of national experts to review the available data on worker health and exposures to tank vapors and to determine the feasibility and types of studies possible. Labor and management proactively worked out an improved approach to mercury monitoring in the workplace. This aggregation of improvements puts us at the forefront of industrial hygiene protective measures in the U.S. Department of Energy complex.

One constant about CH2M HILL's people is their commitment to the community. Not only are we committed to cleaning up Hanford Site tank waste and protecting the environment, our employees are actively involved in volunteering for projects to improve all our lives. Nearly 23 percent of our employees volunteer their time on company-sponsored community projects, and many more volunteer countless hours to projects of their own choosing. Even in this seemingly constant arena, we are seeking new ways to improve the quality of life in our community.

Continuous improvement characterizes the progress on tank farms and Waste Treatment Plant construction efforts being conducted for the Office of River Protection. I speak for all of us when I say that we are committed to quality in all that we do.

Ed Aromi
President and General Manager
CH2M HILL Hanford Group, Inc.

WTP Construction team earns 'Best of Bechtel' Award



Waste Treatment Plant Project Director Jim Henschel speaks with Construction site employees during a recent all-hands meeting. The team of over 1,200 employees was recently named Bechtel's Direct-Hire Construction Team of the Year.

The Waste Treatment Plant Project's Construction team recently received one of the highest of commendations given by Bechtel—the Direct-Hire Construction Team of the Year. Competing against all of Bechtel's Construction teams world-wide, the WTP team received the honor based on superior achievement on eight key corporate objectives: safety, performance, support of the Bechtel charter and vision, employee focus, marketing special strengths, innovation and excellence, sustainability and six sigma and performance-based leadership.

There are three team categories: Direct-Hire Project, Construction Management Project, and Small Project (less than \$100 million). Nominations for selection are forwarded to the Bechtel manager of Construction Engineering and Technologies at year-end. The members of the Construction Committee (i.e., managers of Construction and senior construction managers from across the organization) review the nominations and make the selections at their first meeting of the year.

The award recognizes the efforts, contributions and accomplishments of its construction project teams. To show appreciation, outstanding performance is recognized through the Construction Team of the Year awards.

"The WTP team is the best of the best in Bechtel," said project manager Jim Betts.

The 2003 construction workforce varied from 700 to 900 direct-hire manual employees and 350 to 450 non-manual employees.



Wireless technology...

(Continued from page 1)

Geffre and his staff are working with the Intermec CT 60, a five-pound portable computer that is built to military specifications for use in the field, especially in hot, dusty locations. The unit has a flat screen that is easily read both in bright sunlight and low-light conditions.

Traditionally, the paper copy of the work package accompanies tank-farm workers on the job. For preventive maintenance, the instrument technician usually records information on the work package itself. The hard copy is the record of the data and is sent to a supervisor or shift manager for approval. After the work is approved, a clerk enters the information from the work package into the Job Control System.

It takes about a week from the time an instrument technician performs the preventive maintenance and records data on paper to the time a clerk finishes entering the data into the Job Control System and that preventive maintenance record is available electronically.

Using the wireless Tablet PCs, the technician records his or her readings by either "typing" them—using a special "pen" to touch numbers and letters on a keyboard display on the tablet—or writing notes, which are then translated to type by a script-reading program. The technician checks the data, approves it and then sends it to his or her manager for additional approval. After the manager's approval, the electronic data will become a record.

By using the Tablet PCs in the field, the time it takes for the data to become available is



The components of the Hanford tank farms wireless canopy are two large antennas that transmit and receive information from a receiver unit, an access point and a wireless device such as a ruggedized Tablet PC.

cut dramatically. Geffre estimates a two-day turnaround. "Immediate access to information on calibration will allow the start of other work that relies on the calibration of equipment," he said. In addition to the speedy availability of data, the wireless technology improves data accuracy and reliability.

At press time, nine of the 18 tank farms, the Cold Test Facility and five main office complexes have wireless access. The Hanford Site covers over 560 square miles in southeastern Washington State and, for those whose work duties include field and office work, travel between locations takes time.

"Wireless technology changes the way people work. No longer will the worker in the field have to go into an office to log onto a computer to record work time, refer to procedures, send an e-mail message or access HLAN resources. All these capabilities are available in the field with a Tablet PC or laptop computer with a wireless card," said Ron Nelson, CH2M HILL's chief information officer. "With this technology, we can improve quality and accuracy by entering data once; keep work on schedule by reducing data collection and information access time; and reduce costs through work process efficiencies."

Subcontract awarded for bulk vit

CH2M HILL has awarded a subcontract to AMEC Earth and Environmental, Inc. for services to design, fabricate and deploy a pilot supplemental treatment test and demonstration project. This project is to be performed in the 200 West Area.

Because the Tri-Party Agreement calls for completion of tank waste treatment by 2028, a supplemental treatment method needs to be tested and evaluated by 2006. If successful, a decision on the technology will be made and a production facility constructed by 2011.

AMEC's bulk vitrification method was selected for further testing through a meticulous process that involved the Department of Energy, the Washington State Department of Ecology, and the U.S. Environmental Protection Agency. "After a period of testing and evaluation of 22 different technologies, bulk vitrification showed the most promise to meet mission needs safely, with a high-quality product, and with a reduced cost to the taxpayer," said Ryan Dodd, vice president of Closure Project. The bulk vitrification process would supplement Waste Treatment Plant vitrification and produce an equivalent waste form.

If successful, bulk vitrification is intended to treat some of the low-level or low-level mixed tank waste and allow it to be vitrified inside a large container. The technology of this pilot project involves mixing tank waste with Hanford's silica-rich soil and surrounding it with sand and insulation in a large steel box (50 cubic yards).

Two large electrodes will heat the mixture to about 2,400 degrees Fahrenheit. After it cools, a large brick of black glass remains. The chemicals and the radioactive elements are encased in the glass. The entire container, including the electrodes, will be disposed of in an on-site burial ground.

Members of the AMEC team are DMJM&N, Inc. (Daniel, Mann, Johnson, Mendenhall, Holmes and Narver) and Pacific Northwest National Laboratory. The first melt with non-radioactive material is planned for March 2005, and a radioactive material melt is planned for August 2005.



NEW STACK FOR 222-S LAB: Apollo Sheet Metal workers (from left) Jay Stumpf, Kevin Myers and Dave Kromm prepare to lift and place the huge stack for a new exhaust ventilation system at CH2M HILL Hanford Group's 222-S Laboratory. The need to replace the system was first discussed about nine years ago, when rattling and cracking in the ductwork became noticeable, but the lab made do with numerous patches until this year. The job was completed on time and under budget on June 28. The ventilation system serves all the hoods and hot cells in the 222-S Lab.

Final Pretreatment Facility waste-receipt vessel installed



A crane begins to lift one of the 275-ton waste-receipt vessels over the 56-foot-high Pretreatment Facility wall at the Waste Treatment Plant.

In August, an 18-month engineering, procurement and construction effort culminated with the successful placement of the Pretreatment Facility's four, large stainless-steel waste-receipt vessels—commonly referred to as the 4-pack. Each of the four 275-ton vessels was fabricated on site by Chicago Bridge & Iron Services, Inc. (CB&I), then transported to the PT Facility for placement.

Fabrication began in January 2003, lifting vessel bottoms, rotating and placing them onto temporary carbon-steel transport rings. Each 275-ton vessel has a 1-inch-thick shell and a 1 1/4-inch-thick top and bottom head.

Construction staff began placing concrete for the PT Facility's 8-foot-thick concrete foundation and 5-foot-thick walls beginning in fall 2003. This facility is the final resting place for the waste-receipt vessels. The dual-construction approach eliminated many safety, congestion and scheduling conflicts. The vessels are contained in an area of the PT Facility known as the black cell area, where no human will ever enter once the Waste Treatment Plant begins hot operations.

Early in 2004, the four vessels had begun to take shape. Pulse-jet mixers were installed within the 50-foot-tall vessels. These pulse-jet mixers are non-moving, maintenance-free components within the vessels that keep the tank waste properly mixed as it enters the PT Facility for high-level and low-activity waste separation. The tops of the vessels were lifted and welded into place by spring 2004.

In early August, the first vessel was ready for transporting, rigging, lifting and lowering into the PT Facility. Each vessel would make a three-day trek from the fabrication area, across the construction site and into the PT Facility.

On the first day, crews loaded a vessel onto a heavy-haul transport tractor and flatbed trailer. The vessel was removed from its temporary support columns, using a hydraulic lifting system, and placed onto the flatbed trailer.

On the second day, crews attached rigging equipment and prepared the vessel for separation from the temporary carbon-steel transport ring. The carbon-steel ring was then torched away from the stainless-steel vessel, which was readied for lifting over the PT Facility's 56-foot-high concrete walls.

On the third day, a 600-ton crawler crane was used to safely lift the 275-ton stainless-steel vessel over the PT Facility wall, where it was lowered onto its permanent stainless-steel ring inside the building and welded into place.

The Hanford Waste Treatment Plant is being designed and built for the U.S. Department of Energy by Bechtel National, Inc. and principal subcontractor Washington Group International. The plant, being built over a 10-year period at a cost of \$5.8 billion,

contains three major nuclear facilities that will turn liquid radioactive waste into a sturdy glass using a process called vitrification. Work on the Waste Treatment Plant is about 38 percent complete. The plant is scheduled to be in full operation in 2011.



A waste-receipt vessel is placed inside the walls of the Pretreatment Facility.

Landfill contracts awarded, work begins

CH2M HILL Hanford Group recently awarded two contracts to begin work on the Integrated Disposal Facility, also known as the IDF, a 60-acre landfill that will be located in the 200 East Area of the Hanford Site, just southwest of the closed PUREX facility.

Industrial Constructors, Inc. of Kennewick began work to provide utilities to the IDF site. DelHur Industries, Inc. of Port Angeles, Wash., also brought in equipment to the site to begin site clearing in August.

Low-level waste and mixed low-level waste, including immobilized low-activity waste from the Waste Treatment Plant, will be safely disposed of in the IDF. The landfill is expandable to a total capacity of 900,000 cubic meters and will initially consist of two cells.

Low-level waste will be placed in one cell, while mixed waste and immobilized low-activity waste will be placed in the other cell, which will be permitted by the state of Washington as a Resource Conservation and Recovery Act Subtitle C landfill system. The cells are lined with a 7-foot-thick barrier consisting of a series of gravels, geotextiles, two high-density polyethylene liners and layers of different soils that will isolate the waste from the environment and protect the groundwater from contamination.



This illustration shows how trucks transporting waste for burial will be unloaded in either cell of the Integrated Disposal Facility.

CH2M HILL employee works with Red Cross to help military families

Something in Angela Willingham's voice lets you know that she is willing to listen and help. It is an advantage for Willingham because it is her voice that many a southeastern Washington military family hears when they call the Benton-Franklin Chapter of the American Red Cross for assistance in getting information to a loved one in the military.

When she is not working for CH2M HILL as corrective action management operations specialist, Willingham volunteers as an American Red Cross Armed Forces Emergency Services after-hours caseworker. She is one of 18 Red Cross AFES volunteers in the Benton Franklin chapter, and she spends many of her afternoons, evenings and weekends "on call"—ready to help people who call the local Red Cross office after hours.

When people call for help after the local office closes for the day, the American Red Cross answering service directs the calls to an after-hours caseworker. Willingham often speaks with a distraught family member in the middle of the night who needs to communicate some unhappy news to his or her relative in the military. Whether it is notification of a death, an accident, an illness or divorce, Willingham must follow detailed procedures—to get

positive identifying information on the person to be informed, to verify the event and then to communicate that information to the Armed Forces Emergency Services office in Falls Church, Va. This office then locates the individual and communicates the information to his or her commanding officer. Depending on their assignments, not all military personnel have access to e-mail, and the AFES is often the only way a soldier can get this type of news.

"The more detailed information I can get to identify the receiver, the sooner the message can be transmitted through AFES," said Willingham. "Under stressful situations military family members wishing to relay messages may not have the receiver's rank and Social Security number with them, so AFES must trace that individual, and that can delay the message."



Willingham

Fortunately, the news isn't all bad, and sometimes the volunteers can help reunite military families for joyful occasions. Willingham recently assisted in bringing home a serviceman to witness his daughter's birth. His two-week leave from duties in Iraq had to be coordinated well in advance of the birth, and involved Willingham verifying the delivery due date with the mother's doctor.

Occasionally, her on-duty weekends have found Willingham fielding several cases at once—juggling calls on her home phone and the cell phone that the Red Cross provides for after-hours caseworkers.

Willingham became a volunteer in February 2002, in response to an advertisement for the American Red Cross AFES program. After filing an application and undergoing a background check, she was trained and certified in basic casework and the art of helping. Willingham is also aware of the wealth of community assistance available to military families and is also a disaster relief volunteer trained in logistics, human resources and operations staffing. Regarding her volunteer service, she said, "It is a way of giving back to the community, our military personnel and their families."

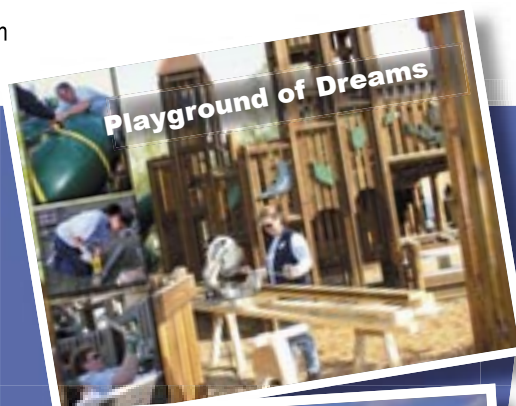
Employees show community spirit

Spring cleanup, helping rebuild the Playground of Dreams and walking to raise money for the March of Dimes and the American Cancer Society were but a few of the many community service activities that CH2M HILL and Bechtel employees participated in this quarter.

Trails were maintained, and senior citizens' yards were cleaned up by CH2M HILL volunteers on Earth Day in April. Both companies fielded volunteers to rebuild the Playground of Dreams, a landmark for the children of the Tri-Cities. This playground, originally built by volunteers in 1999, was destroyed by fire in late 2003.

Walkers from both companies participated in the March of Dimes WalkAmerica in April and the Bechtel team raised \$15,000. At the Relay for Life in June, CH2M HILL employees raised \$15,500 for the American Cancer Society.

CH2M HILL honored veterans and active-duty military personnel at a Memorial Day observance, which featured a satellite broadcast of the World War II Memorial dedication from Washington, D.C.



WTP management responds to vapor concerns

In response to feedback from construction workers at the Waste Treatment Plant Project, the WTP Safety Assurance organization has beefed up the construction site's air monitoring program and equipment. The goal is to monitor the air quality at the site to ensure that vapors from Hanford's underground waste tanks or from construction activities do not affect the health and safety of WTP workers.

Here are the measures being taken at the construction site:

- Four different techniques are being used to monitor for chemical vapors, primarily ammonia, nitrogen oxides and volatile organic compounds.
- Three electronic monitors continuously monitor the air in and around the construction site.
- Ten diffusion-tube passive monitors, placed in and around the site to monitor for nitrogen oxides and ammonia, are checked several times a shift.
- Flame and photo-ionization instruments are used by industrial hygienists to conduct surveys of work areas and investigate odor reports and concerns.
- Industrial hygienists are also using a portable infrared analyzer that can identify and measure 150 different chemicals. This instrument is used to evaluate and verify data from the other instruments.
- Emergency plans in place to protect WTP workers in the event of an accident at the tank farms have been reviewed.
- WTP Safety Assurance, Site Management, and Security now have text pagers and are included on the tank farm call-out list so they will be immediately notified of a significant event at the tank farms.
- WTP Safety Assurance is working with the U.S. Department of Energy Office of River Protection and the other Hanford contractors to keep informed of developing information on monitoring, health information, chemicals and other hazards associated with the tank farms.

The equipment gives Safety Assurance personnel the tools to respond to reports of chemical odors and to determine whether vapors are drifting onto the WTP site from the tank farms, or whether the adhesives, solvents, cleaners, welding and exhaust fumes generated during construction are causing problems.

"Communication to and feedback from our employees is the key to our zero accidents philosophy. It is critical that WTP people keep Safety Assurance informed," said Clay Davis, Safety Assurance manager. "Anyone with a question, concern, observation or even a suspicion owes it to themselves and their co-workers to talk directly with their supervisor or area safety representative to get answers."

Health Effects Panel begins work on vapor exposures

The Health Effects Panel sponsored by CH2M HILL's corporate offices held its first series of meetings in June as it launched its review of data on worker exposure to tank vapors. The panel will determine if there is enough data to perform a meaningful study to evaluate the potential for long-term health effects from vapor exposure.

"This is an exciting opportunity to work with an outstanding group of health professionals on a project that will have a positive impact on the health of our workers," said Dr. Susan Eberlein, who is heading the effort for CH2M HILL.

The panel is led by Dr. Jack Mandel, chairman of the Department of Epidemiology at Emory University in Atlanta, Ga. Others on the panel include four nationally recognized medical experts in toxicology, occupational medicine and industrial hygiene. They are:

- Dr. John Dement, Duke University (occupational/environmental medicine, industrial hygiene)
- Dr. Melissa McDiarmid, University of Maryland (occupational medicine, cancer mechanisms)
- Dr. Rudy Jaeger, Environmental Medicine, Inc. (toxicology, environmental medicine)
- Dr. Phil Harber, University of California, Los Angeles (pulmonary/respiratory medicine).

Dr. Harber was unable to attend this meeting, but has been working with the team via teleconference and will visit Hanford in the future. The team's visit began with a tour of the Cold Test Facility to see the tank mock-up and learn about tank farm layout. The tour was followed by a series of presentations from CH2M HILL management dealing with tank contents, vapor samples, toxicology information and medical monitoring practices.



During their visit in June, members of the Health Effects Panel answered questions from workers.

A key element of the visit was an open discussion with representatives of the tank farm workforce. Workforce representatives were invited from safety councils, the Chemical Vapor Solutions Team, the Hanford Atomic Metal Trades Council safety representatives and the shop stewards. The input the team received from the workforce is instrumental in shaping the panel's path forward.

The panel's mission is to review the available data on worker health and exposures to tank vapors, to determine what type of study would be feasible and what could be learned from a study. Data evaluation and feasibility assessment will take place over the next few months. Several types of studies will be considered.

The team will also review the type of medical testing that is performed during routine examinations, and the testing that is performed following a vapor exposure. They will make recommendations on additional types of information that could be collected both to ensure the best diagnosis and treatment, and to provide a basis for future or ongoing evaluations of long-term health effects.

The Health Effects Panel is one more element of CH2M HILL's overall commitment to worker health and safety.

First director of CH2M HILL Environmental Health named

In a move that will significantly strengthen its Industrial Hygiene program, CH2M HILL has hired Dr. Thomas J. Anderson as the first director of Environmental Health. He was selected for this important post because of his technical credentials, his strong leadership skills and his national reputation in the industrial hygiene field. He reports to the vice president for Environmental, Safety, Health and Quality (ESH&Q).

"Industrial hygiene is crucial to protect our workers at Hanford, and Dr. Anderson's expertise and leadership will guide the ongoing efforts to give workers full confidence in their health and safety," said Rich Higgins, acting vice president of ESH&Q. The creation of the new position makes CH2M HILL unique in the DOE complex in the management focus placed on industrial hygiene and, more specifically, workplace exposure.

"One of Dr Anderson's chief responsibilities will be applying the concept of ALARA (as low as reasonably achievable) to chemical

vapor exposures, which will move us into the forefront of protecting worker health and safety," Higgins said.



Anderson

Anderson came to CH2M HILL from the University of Wisconsin-Whitewater where he was an assistant professor of occupational and environmental safety. He is the former commanding officer of the Navy Occupational Safety Training Center in Norfolk, Va. Prior to that, he was the officer in charge of the Navy's Environmental and Preventive Medicine Unit in Sicily. He has also served in a number of other health and safety leadership roles in the Navy as well as in the civilian world.

Anderson earned his doctorate in environmental toxicology from Miami University and is a Certified Industrial Hygienist.

Department of Energy reduces risk to groundwater and Columbia River

Cleanup of the U.S. Department of Energy's Hanford Site took a bold step forward this year with the removal of all the pumpable liquids from the underground single-shell radioactive waste storage tanks.

In the project known as "interim stabilization," employees of CH2M HILL Hanford Group, Inc., the primary tank farm contractor, moved more than 3 million gallons of liquids to safer, double-shell tank storage, thereby ensuring that the aging single-shell tanks will never again leak waste to the surrounding soil. These aging tanks have leaked as much as a million gallons in the past, and this project ensures that no more waste will leak to the environment.

But the project was more than just moving waste; it is also about completing major upgrades in the tank farms to further protect the soil beneath the tanks and to make waste transfers more streamlined. Water control features have been installed around the single-shell tank farms to prevent rainfall runoff from flowing into the farms. This action prevents rain and snow from potentially driving contamination further toward the groundwater. In addition, water lines serving the tank farms have been tested and those found to be leaking were cut and isolated from the system, never to be used again.

Now that the liquids have been removed from the waste tanks, attention is turned to removing the sludges and solids that are left behind. The goal, as spelled out in the Tri-Party Agreement, is to retrieve at least 99 percent of the waste from the tanks. Once retrieval is completed, the small amount of materials that is left behind could be stabilized in order to ensure it will remain in place. After that, surface barriers and other protective actions will assure that the waste remains stable in perpetuity.

But dealing with the waste in the tanks is only one aspect of tank waste cleanup.

Appropriate actions must be taken to clean up and stabilize ancillary equipment such as buried pipelines and other elements of infrastructure that are no longer needed. Any contaminants that may have leaked from aging pipes in the past must also be cleaned up.

The Columbia River is a treasured resource and the reduction of the risk to the river posed by the waste is the highest priority. The Office of River Protection continues to work closely with the public and its regulatory partners to achieve this objective, and is making progress every day.



Flowers bloom on the bank of the Columbia River.

Plant species adapt to hot, dry Hanford summers

People survive Hanford's hot summer days by wearing lightweight clothing and sunscreen and drinking plenty of water. And when our work is done, we seek the shade, an air-conditioned building or the river to cool off. Other inhabitants of the Hanford Site's shrub-steppe and river-bank environments—some 700 species of native and introduced plants—do not have the luxury of mobility, and they have adapted to the area's dry climate.

Michael Sackschewsky, a botanist at the Pacific Northwest National Laboratory in Richland, sums up the ability of plants to cope this way, "Plants survive in xerophytic, or dry, environments by avoiding the drought; having a more efficient way of making food; and by developing physical characteristics that help reduce the effects of high temperatures and a limited supply of water."

Plants photosynthesize—they use light, water, carbon dioxide and minerals that they absorb from the soil to make their own food, which are sugars. During photosynthesis, water and oxygen are released through the leaves. The sugars are produced for the plants' immediate growth needs or are stored in other plant structures such as roots, tubers, stems and seeds for future use or reproduction.

Most of the plants on the Hanford Site survive by avoiding the summer heat and drought—most of their growth, flowering and seed production are complete before the summer heat arrives. You

can witness this adaptation by taking some time to see the spring display of flowers on site and on the Hanford Reach National Monument. When the temperature rises and the days grow long, the leaves and flowers of these plants die, and the plant survives as a seed that will sprout in fall or early spring, or as a dormant crown, tuber or root, biding its time for more favorable growing conditions.

Sackschewsky notes, "Cheatgrass is a very successful introduced grass, an annual weed that avoids the heat by sprouting from seed in fall, growing in the moist and milder temperatures of late winter and producing large numbers of seeds in spring."

Other ways of surviving the heat include changes in the way plants photosynthesize. Some cacti absorb light energy during the day, store it and use it at night to make more efficient use of water. Some plants, such as Russian thistle, commonly known as tumbleweed, and a few of the native grasses, make different sugars than other plants do. This also maximizes the use of limited water.

Many of Hanford's native plants have physical features that minimize water loss and maximize water uptake. Small, narrow, or hairy leaves reduce water loss, as does a waxy coating of stems and leaves. Deep roots to reach water far below the soil surface, and extensive shallow root systems are designed to absorb the water from the rare summer rain showers.

Some plants use a combination of adaptations to cope. Our most common shrub, big sagebrush, has two sets of leaves: larger and softer leaves in winter make use of the relatively moist and cooler climate; these drop to allow the plant to produce a summer set of small leaves with a thick cuticle to conserve water. Sagebrush also has a deep root system that allows it to tap into water present far below the soil surface.



Carey's balsamroot (*Balsamorhiza careyana*) flowers and sets seed in late spring and early summer, then dies back to avoid the heat and drought of Hanford's late summer.



Big sagebrush (*Artemisia tridentata*) has narrow leaves to minimize water loss and a deep root system to make use of water far below the soil surface.



VIP VISIT: Congressman David Hobson (left), Chairman of the House Appropriations Subcommittee on Energy and Water Development, toured the Hanford Site May 25 along with Congressman Rodney Frelinghuysen (right), also of the House Energy and Water Development Subcommittee. Congressmen Hobson and Frelinghuysen toured the site at the invitation of Congressman Richard "Doc" Hastings of Washington (center). The congressmen toured the tank farms, received briefings on tank retrieval and closure, supplemental technologies, and transuranic mixed waste in tanks in addition to taking a walking tour of the Waste Treatment Plant construction site.

The *River Sentinel* is published quarterly for all employees of the Office of River Protection and its contractors.

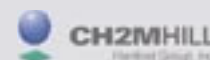
For questions or comments, please contact:



Office of River Protection
Erik Olds
(509) 372-8656, FAX (509) 376-8142



Bechtel National
John Britton
(509) 371-2328, FAX (509) 371-2393



CH2M HILL Hanford Group
Cornelia Brim
(509) 376-3165, FAX (509) 373-9801